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# The Campbell Micro-Fossil Washer

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By Carlyle B. Campbell

I am deeply grateful for the privilege of presenting this process of micro-fossil washing, because it is a long step toward perfection in micropaleontology. With the speed and efficiency with which micro-fossils can now be removed from shales which were heretofore considered too hard to be worked, a whole new era lies before us.

In 1947, Dr. Youngquist, then of the University of Iowa, presented a paper before this Academy entitled, "Notes on the Occurrence of Conodonts in Iowa", in which he stated that I had found "A well preserved but sparse conodont fauna." This I estimated at 200 Conodonts per ounce of residue, washed out without the machine. A short time later, with my machine in operation, I washed out and sent to Dr. Youngquist a Conodont residue sample which I believe to be of the same horizon, and only a short distance away. He then wrote me, "They are indeed well preserved and varied. It is the best Pennsylvanian Conodont fauna with which I am acquainted—but boy! what a fauna". This I estimated at 37,000 Conodonts per ounce of residue.

I then took two like samples of shale, washed one without the machine, and found six conodonts; the other I washed with my machine and found an estimated 1,538 conodonts.

I began to think that conodonts could be found almost everywhere, and with this machine, so it seemed. I found conodonts in the Virgil, Missouri, Des Moines and Cherokee series of the Pennsylvanian of Iowa; the Pella beds of the St. Louis lime; the Burlington lime of the Mississippian of Iowa; and in the Maquoketa formation of the Ordovician of Iowa. These I understand were new discoveries.

Dr. Sturgeon of the University of Ohio had some hard shales in the Carboniferous that he could not successfully break down. He sent me these shales over a period of two years and was well pleased at the way my machine washed out his fossils.

Dr. McNulty of the University of Oklahoma wished to trace the Foraminifera through the Austin Chalk of Texas, but was unable to break down over 400 samples of this type of rock. Learning of my machine, he sent me the samples, which I washed out and returned. He wrote, "You and your machine have truly got something—I will be indebted to you for saving me literally months of work in boiling by the old method".

I sent a machine to our State University, and Dr. Downs wrote, "The washing machine has been working continuously, and, as usual, with perfect results. It has certainly proved its worth in gold, and has saved me many, many hours of hand washing, not to mention the fine results that it gives".

Dr. Hussey and Dr. Thomas of our State College at Ames built their own machine, copied after mine, and they wrote, "The machine has the ability of breaking down samples which, up to the present, other washing methods have been unable to do. The Department of Soils may also use this machine for the separation and study of clay minerals".

Residue from this machine sent to Dr. Helgi Johnson of Rutgers University, New Brunswick, New Jersey, brings this reply: "We have appreciated your collecting efforts immensely, and our graduate students in Micropaleontology have even cussed you a little bit at times for finding such rich material".

In 1946, Dr. Youngquist had told me that the conodonts I had found could not be used for research work, because they were imbedded in hard shale. I took two weeks off my job, my family being away on vacation, and I guess I tried every possible means of removing these tiny teeth from the hard rock in which they were imbedded. Finally I came to the conclusion that as nature had sealed these specimens in, nature could best remove them, and with this in mind, I built a "Rapid Erosion Machine", which I improved by correcting errors, and the result is this:

If an air tight tube eight to ten diameters long, and not exceeding eighteen inches in length, has been filled one-fourth full of shale, broken into pieces small enough to permit it to move freely in the tube, and the tube is further filled one-half to three-fourths full of water, and then the tube is revolved, so that the center of the tube is the center of rotation, at 25 to 35 revolutions per minute; centrifugal force will keep the shale in place at the bottom of the tube until its position is reversed and the shale is near the top of the tube; likewise, the air which was over the water is near the bottom of the tube. Centrifugal force is now overcome by gravity, and the heavy rock and lighter air changing places causes a reversal of the high and low pressure areas within the air tight tube. This push-pull action, together with the washing effect of the water, gently separates the fossils from their matrix and reduces the rock to muddy water.

Now place this muddy water in a high walled container, like a gallon jar. Fill the jar with water and permit it to settle. Conodont residue should settle for one-half minute, but smaller specimens,

such as small Foraminifera should settle for three to five minutes. Then gently pour off the top half of the muddy water and refill with clear water. Repeat this until the contents of the jar is clear; then place contents in a pan and dry. If, after examining, you find that your specimens are not clean enough, put it back in the machine for a repeat washing.

The length of time required to wash a sample of shale will vary. Most carboniferous shales wash out in six to twelve hours, but when washing out harder formations, twelve hours or more is required. When washing Austin chalk for Foraminifera, the muddy water, when first taken from the machine, will have a specific gravity as high as 1.250, or 25% higher than clear water. This will require a longer time to settle. This time can be reduced during the rinsing, as the water becomes clearer from five minutes down to three minutes.

In order to speed up the washing, I recommend a machine with a number of tubes; I prefer one with eight tubes. In this way, eight different samples can be washed at the same time, and in rinsing, there is no time lost in waiting for the muddy water to settle, as it will settle while you are emptying and filling other jars.

Be sure to see that the motor runs cool enough for constant use. This can be done by mounting small fan blades on its axel, near the motor. Be sure to have a safety outlet in each tube, to relieve extreme pressure that will sometimes build up. I use a rubber gasket under the cap of the tube with a large opening in the cap. The tubes are of iron with a cap on either end, making it much easier to clean.

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